TOTAL MARKS | |

INTERNATIONAL SECONDARY CERTIFICATE
EXEMPLAR 2021

FURTHER STUDIES MATHEMATICS (EXTENDED): PAPER II
MODULE II

EXAMINATION NUMBER													

Time: 1 hour 100 marks

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY

1. This question paper consists of 8 pages and an Information Booklet of 2 pages (i–ii). Please check that your question paper is complete.

2. **Answer ALL the questions on the question paper and hand it in at the end of the examination. Remember to write your examination number in the space provided.**

3. Non-programmable and non-graphical calculators may be used, unless otherwise indicated.

4. All necessary calculations must be clearly shown and writing must be legible.

5. Diagrams have not been drawn to scale.

6. Round off your answers to 4 decimal digits, unless otherwise indicated.

FOR OFFICE USE ONLY: MARKER TO ENTER MARKS

Q1	Q2	Q3	Q4	Q5	TOTAL
29	**21**	**17**	**23**	**10**	**/100**

QUESTION 1 STATISTICS

1.1 A vegetable bowl contains 4 carrots and 7 green beans. Riyaadh randomly takes out three vegetables and eats them. Find the probability that …

(a) 2 green beans and 1 carrot are eaten, in any order.

(6)

(b) the third vegetable eaten is a green bean.

(7)

1.2 From a survey done at her school, Kate found that 60% of the students wore a watch on their left wrist, 30% wore a watch on their right wrist and 10% did not wear a watch.

(a) From a random sample of 20, how many students can Kate expect not to be wearing a watch?

(2)

(b) Given a random sample of 5 students, find the probability that at most 3 students wear a watch on their **right** wrist.

(7)

(c) A random sample of 200 students was taken. Using the normal approximation, find the probability that more than 125 wore a watch on their **left** wrist.

(7)
[29]

QUESTION 2

2.1 The number of eggs laid by a sample of 90 female sea gulls are shown in the table.

Number of eggs	1	2	3	4
Frequency	15	45	20	10

(a) Find the mean and standard deviation, to two decimal places, of the number of eggs laid per sea gull.

(7)

(b) Seth noticed that the sample did not include female sea gulls that laid no eggs. How would the mean and standard deviation change if these sea gulls were included?

(2)

2.2 When Nicola is stung by a bee she always develops an allergic reaction. The time taken in minutes for Nicola to develop the reaction can be modelled using the probability density function given by

$$f(x)=\begin{cases}\dfrac{k}{x+1} & 0\le x\le 4\\ 0 & \text{otherwise}\end{cases}$$

where k is a constant.

(a) Show that $k=\dfrac{1}{\ln 5}$.

(6)

(b) Find the median time for Nicola to develop a reaction.

(6)
[21]

QUESTION 3

3.1 The random variable $Z \sim N(0,1)$ {i.e. with mean, 0 and variance, 1}

- R is the event $Z > 1,1$
- Q is the event $-1,8 < Z < 1,8$

Determine:

(a) $P(R)$

(3)

(b) $P(R \cup Q)$

(6)

3.2 The random variable X has a normal distribution with a mean of 200 and a standard deviation 50. Find the value of *c* if it is given that $P(X > c \mid X > 280) = 0,625$.

(8)
[17]

QUESTION 4

4.1 When the council published a plan for a new road, only 15% of local residents accepted the plan. The council then published a revised plan and, out of a random sample of 300 local residents, 60 accepted the revised plan.

(a) Determine a 98% confidence interval for the proportion of all the local residents who accepted the **revised** plan.

(6)

(b) Using the confidence interval in Question 4.1 (a), is there evidence to support the claim that the proportion of local residents who accepted the revised plan is greater than the support for the original plan?

(2)

4.2 A pharmaceutical manufacturer purchased two medicine bottle-filling machines. In order to compare the performance of the two machines, a random sample of 60 bottles filled by the first machine and a random sample of 50 bottles filled by the second machine were checked. The volumes of the contents from the first machine (x), and from the second machine (y), are summarised as follows:

$n_x = 60$	$\bar{x} = 30{,}06\,\text{ml}$	$\sigma_x^2 = 0{,}0784$
$n_y = 50$	$\bar{y} = 29{,}84\,\text{ml}$	$\sigma_y^2 = 0{,}168$

(a) Test, at the 2% level of significance, whether the mean volume content for the first machine is greater than the mean volume of the second machine.

(10)

(b) Find the set of values of α for which there would be evidence at the $\alpha\%$ significance level that $\mu_x - \mu_y > 0{,}1$.

(5)
[23]

QUESTION 5

Consider the word **CEASELESS**.

5.1 How many ways can the letters of the word **CEASELESS** be arranged?

(4)

5.2 Find the number of different ways in which the 9 letters of the word **CEASELESS** can be arranged if exactly two of the Es are next to each other.

(6)
[10]

Total: 100 marks